KINGSTON TECHNOLOGY
FAST ETHERX 5-PORT & 8-PORT
10/100TX WORKGROUP
FAST ETHERNET SWITCH
USER'S GUIDE

MODEL(S): **KNS500/WG**
KNS800/WG

Kingston Technology's

Fast EtheRx
5-Port & 8-Port
10/100TX Workgroup
Fast Ethernet Switch

User's Guide

Part No. 4460074-001.B01

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Introduction

Intended Audience: This manual assumes that the user has a general working knowledge of networking principles and architecture and is familiar with network systems in general.

Congratulations on the purchase of your new Kingston Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch. There are two models: the KNS500/WG and KNS800/WG, 5-port and 8-port Workgroup Fast Ethernet Switch, respectively. The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch offers five (5) or eight (8) UTP (Unshielded-Twisted Pair) ports that auto-negotiate speed detection for 100BASE-TX or 10BASE-T connections and half-duplex / full-duplex mode operation. The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch provides automatic switching between 100Mbps and 10Mbps networks thus allowing 100BASE-TX Fast Ethernet networks to communicate with 10BASE-T Ethernet networks. The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch can also be used to segment 10Mbps or 100Mbps networks. The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch complies with IEEE 802.3u 100BASE-TX, IEEE 802.3i 10BASE-T, and IEEE 802.3 CSMA/CD Ethernet Standards.

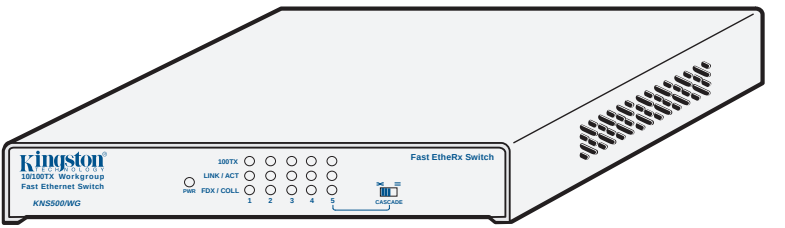
The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch supports both half and full duplex flow control to reduce the risk of data loss at congested ports. When a port is operating in half-duplex mode, the Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch implements a collision-based backpressure flow control mechanism. When a port is operating in full-duplex mode, the Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch implements the IEEE 802.3x flow control mechanism.

The Fast EtheRx 10/100TX Workgroup Fast Ethernet Switch may be used in both standard desktop and workgroup installations and requires no hardware or software configuration.

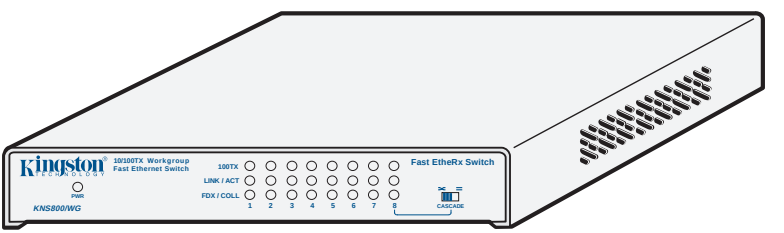
To facilitate fast and easy installation and network configuration, the last UTP port has a cascade switch that supports UTP cabling in the straight through and/or crossover wiring configurations. For easy recognition of network status and troubleshooting, the front panel includes a variety of diagnostic LEDs including Power, 100TX Speed Detection, Link, Activity, Collision, and Full-Duplex status.

For the remainder of this manual, the Fast EtheRx 10/100TX Workgroup Fast Ethernet Switches will be referred to collectively as the Fast EtheRx Switch.

Model Types



Model KNS500/WG



Model KNS800/WG

Special Features

- Provides automatic switching function between 100Mbps and 10Mbps
- Interconnect 100BASE-TX Fast Ethernet with 10BASE-T Ethernet networks
- Auto-Negotiation for 10/100Mbps speed selection, and for half-duplex and full-duplex mode
- Uses **Store and Forward** switching approach to minimize re-transmission of faulty packets
- Filtering/Forwarding rate of 148,800 packets/second at 100Mbps
- Filtering/Forwarding rate of 14,880 packets/second at 10Mbps
- Supports up to 1K MAC addresses
- Supports collision-based backpressure flow control in half-duplex operation
- Supports IEEE 802.3x flow control in full-duplex operation
- Link, Activity, 100TX Speed Detection, and Full Duplex LEDs for easy troubleshooting
- Power LED and Collision LED for collision detection
- Last UTP port supports crossover or straight-through cabling
- Conforms to IEEE 802.3u 100BASE-TX, IEEE 802.3i 10BASE-T, and IEEE 802.3 CSMA/CD Ethernet Standards

Package Contents

Your Fast EtheRx Switch package should contain the following items:

- ❑ Fast EtheRx KNS500/WG or KNS800/WG Workgroup Fast Ethernet Switch
- ❑ External power adapter (KNS500/WG)
- ❑ External auto-sensing power supply (KNS800/WG)
- ❑ AC power cord (KNS800/WG only)
- ❑ (4) Rubber feet
- ❑ User's Guide

If any of the above items are missing or damaged, please contact your Kingston dealer for a replacement. Be sure the items you receive are genuine Kingston products. If the Kingston name and logo are not on the front panel of your unit, it is not a genuine Kingston product.

Design Features

Switching Function

The Fast EtheRx Switch is basically designed to bridge Standard 10BASE-T Ethernet networks to 100BASE-TX Fast Ethernet networks and to segment 10Mbps or 100Mbps network segments.

Auto-Negotiation

Auto-Negotiation provides the means of automatically establishing a link by detecting the link capabilities of the connected device on the network to select the best operational mode available (i.e. 100BASE-TX/10BASE-T selection, half- / full-duplex mode operation, etc.)

Full-Duplex

Full-Duplex transmission means that dedicated inbound and outbound channels are established for bi-directional transmission of data. This allows the collision detection mechanism (CSMA/CD) to be by-passed, thus decreasing transmission delay normally caused by listening, collisions, and packet resends when operating in half-duplex mode.

Store-and-Forward Switching

The Fast EtheRx Switch uses a packet-forwarding method called **Store-and-Forward**, which minimizes the re-transmission of faulty data packets. This means that the Fast EtheRx Switch can store the incoming frame in an internal buffer and check the packet for errors before sending it out to the destination port. If the frame does contain errors, it will be discarded and then retransmitted.

Flow Control

In half-duplex mode the Fast EtheRx Switch implements a collision-based backpressure flow control mechanism that reduces the risk of data loss at congested ports. This is accomplished by forcing a collision with the data frames on all ports once the free-buffer queue has reached the pre-set minimum.

In full-duplex mode the Fast EtheRx Switch implements the IEEE 802.3x flow control mechanism. This is accomplished by sending a PAUSE packet on a port when the number of buffers allocated to this port exceeds the pre-set minimum.

Hardware Installation

Before you begin installing network cables, please take a few moments to familiarize yourself with Fast EtheRx Switch. The functions on the front and rear panels are illustrated in the following sections.

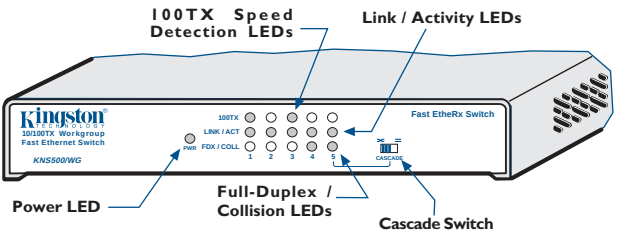


Fig. 1 – KNS500/WG Front Panel

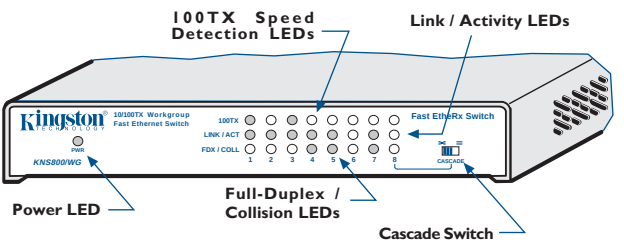


Fig. 2-KNS800/WG Front Panel

Front Panel

Power LED

The PWR LED indicates the power status of the Fast EtheRx Switch. The LED will light up steady green when the AC power cord is connected to the unit from a power source.

100TX Speed Detection LED

The 100TX LED will automatically light up when 100Mbps operation is detected. This LED will not light up if 10Mbps operation is detected.

Link / Activity LED

The LINK/ACT LED uses a single LED to display two functions. A steady green light indicates that a good link has been established, and a flashing green light indicates when data is being received or transmitted. If the LED does not display solid green indicating a good link, check the following:

1. Make sure that the power is turned on for both the Fast EtheRx Switch and the attached device.
2. Verify that the drivers for the network adapter have been loaded on the PC. Some network adapters require that the driver be loaded before establishing a proper link.
3. Make sure the cable is wired properly and connected on both ends.
4. Make sure the correct cable type has been selected.
5. If steps 1 through 4 are correct, please check the cable, as it may be defective or wired incorrectly. Replace the cable and try again. Please refer to Appendix A for *Pin Assignments* and Appendix B for *Cabling Guidelines.*

Full Duplex and Collision LED

The FDX/COLL LED uses a single color LED to display two functions. A solid green light indicates that Full-Duplex operation has been detected. A flashing amber light indicates that a collision has occurred in half-duplex mode. Full-Duplex mode is auto-negotiated on all UTP ports.

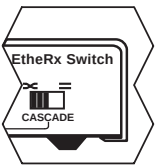
Cascade Switch

The cascade position marked "⤫" configures the last UTP port (port 5 on the KNS500/WG or port 8 on the KNS800/WG) as internally-crossed like all other UTP ports. By default, all repeater and switched UTP ports are generally configured as standard MDI-X, or internally-crossed ports. With a straight-through cable, this port can be used for cascading to a standard MDI device, such as a network adapter or router. With a crossover cable, this port can be used for cascading to another MDI-X device, such as a hub or switch.

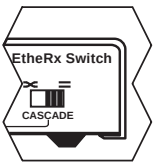
The cascade position marked "═" configures the last UTP port (port 5 on the KNS500/WG or port 8 on the KNS800/WG) as straight-through. With a crossover cable, this port can be used for cascading to another MDI device, such as a network adapter or router. With a straight-through cable, this port can be used for cascading to an internally-crossed MDI-X device, such as a hub or switch.

The following diagrams show the relationship between cable type and which cascade configuration to use. To verify the pin wiring of your UTP cable, see *"Appendix A Pin Assignments."*

Using a Straight-Through Cable

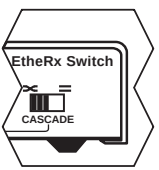


Leave the cascade switch in the default crossover (MDI-X) position when connecting the last UTP port on the Fast EtheRx Switch to a network card or router (or other MDI configured device).

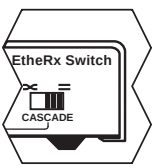


Move the cascade switch to the straight-through position when connecting the last UTP port on the Fast EtheRx Switch to another hub or switch (or other MDI-X configured device).

Using a Crossover Cable



Leave the cascade switch in the default crossover (MDI-X) position when connecting the last UTP port on the Fast EtheRx Switch to another hub or switch (or other MDI-X configured device).



Move the cascade switch to the straight-through position when connecting the last UTP port on the Fast EtheRx Switch to a network card or router (or other MDI configured device).

Notes on MDI and MDI-X

MDI (Media Dependent Interface) is the standard that defines the mechanical and electrical configuration of a UTP port. For any two devices to communicate with each other on the network, the transmitter of one device must be connected to the receiver of the other device. This can be achieved by using a crossover cable, or by using the MDI-X port, which implements the crossover internally.

Port 1 through port 4 on the KNS500/WG, and port 1 through port 7 on the KNS800/WG, like all normal hub ports, are configured MDI-X. The last UTP port, port 5 on the KNS500/WG, or port 8 on the KNS800/WG, supports both port configurations, MDI and MDI-X. All NICs (Network Interface Cards) and Router ports are usually by default configured MDI. A simple illustration shows the relationship of cable types to port types:

Switch Position	Port Config	For Connection to another Hub Port (MDI-X)	For Connection to a Network Adapter (MDI)
⤫	MDI-X	Use Crossover cable	Use Straight-through cable
—	MDI	Use Straight-through cable	Use Crossover cable

Rear Panel

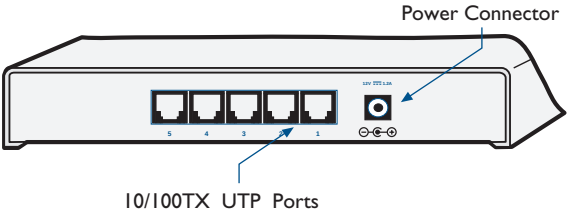


Figure 3 – KNS500/WG Rear Panel

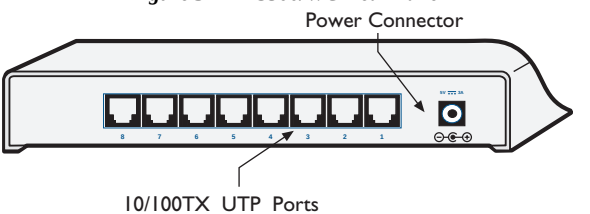


Figure 4 – KNS800/WG Rear Panel

Power Connector

The Fast EtheRx Switch gets its power from the external power adapter. Insert the power jack into the power connector located to the far right. For safety purposes, ONLY use the included power supply for proper operation. The wrong type of power supply may cause damage to both the Fast EtheRx Switch and the power supply. Please note the KNS500/WG and KNS800/WG use different power adapters.

NOTE: The power adapter DC output voltage varies depending on the model type. Be sure to use the correct power adapter. Please refer to *"Appendix C Specifications"* for the differences in the DC output voltage requirements of the Fast EtheRx Switches. Polarity on the power jack and DC power connector is negative (-) on the outside and positive (+) on the inside.

10/100TX UTP Ports

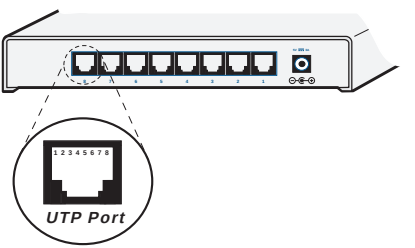
The Fast EtheRx Switch has either five (5) or eight (8) UTP ports that auto-negotiate 100BASE-TX or 10BASE-T connections and half- or full-duplex mode operation. All ports, like all normal switch ports, are generally configured as MDI-X. However, the last UTP port (port 5 on the KNS500/WG or port 8 on the KNS800/WG) supports both MDI-X and MDI port configuration. Please refer to *Cascade Switch* on page 6.

Appendices

Appendix A Pin Assignments

UTP Port Pin Assignments

The UTP ports use RJ-45 Unshielded Twisted Pair (UTP) cabling. Connector pin numbers and pin wiring assignments are listed below in Figure A-1 and Table A-1, respectively. Twisted-Pair cables can be wired with either straight-through or crossover pin assignments. Both wiring schemes are mentioned in *"Appendix B Cabling Guidelines"* for reference in creating a twisted-pair cable.



Each UTP port is configured as "MDI-X", or internally crossed. By default, all repeating and switched UTP ports are generally configured as MDI-X, unless otherwise specified. The last UTP port (port 5 on the KNS500/WG and port 8 on the KNS800/WG) is linked to a cascade switch that allows it to support UTP cabling in the straight-through (MDI) and crossover (MDI-X) wiring configuration. See page 7 "Notes on MDI and MDI-X" for details.

Fig. A-1 RJ-45 Connector Pin Numbers

Pin Number	MDI-X	MDI
1	Receive Data +	Transmit Data +
2	Receive Data -	Transmit Data -
3	Transmit Data +	Receive Data +
4,5	Not Used	Not Used
6	Transmit Data -	Receive Data -
7,8	Not Used	Not Used

Table A-1 UTP Pin Assignments

Appendix B Cabling Guidelines

UTP Cable Type

When installing network cables, the following table shows appropriate cabling guidelines for 100BASE-TX Fast Ethernet architecture.

Cabling Components:	100BASE-TX
Trunk and Patch Cable Type:	4-Pair 100Ω UTP CAT 5 (only 2 pairs used)
Modular Plug:	8-Pin RJ-45 CAT 5 only
Patch Panel:	8-Pin RJ-45 CAT 5 only

Table B-1 Network Cable Guidelines

(**NOTE: All UTP cables come in both solid and stranded filament. Solid filament cables are more rigid and usually intended for trunk cabling. Stranded filament cables are more pliable and generally targeted for patch cables. For proper termination, use the correct RJ-45 connector, as they differ for each type of cable.)**

UTP Cable Wiring

UTP cables are wired based on one of two standard pin configurations: **Straight-Through** and **Cross-Over**. 100BASE-TX uses only Category-5 UTP cables with four pairs of wire as illustrated below in Tables B-2 and B-3.

"Straight-Through" Configuration

Pin Number	Pin Number
1 (TRX+)	1 (TRX+)
2 (TRX-)	2 (TRX-)
3 (RCV+)	3 (RCV+)
6 (RCV-)	6 (RCV-)
4, 5, 7, 8	Not Used

Table B-2. Straight-Through Wiring

"Cross-Over" Configuration

Pin Number	Pin Number
1 (TRX+)	3 (RCV+)
2 (TRX-)	6 (RCV-)
3 (RCV+)	1 (TRX+)
6 (RCV-)	2 (TRX-)
4, 5, 7, 8	Not Used

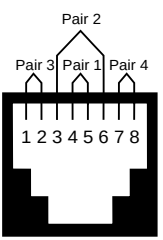
Table B-3. Cross-Over Wiring

UTP Cable Wiring Standards

There are two governmental agencies: the Electronic Industry Association (EIA) and the Telecommunications Industry Association (TIA), which set the standard for all cable wiring requirements for commercial buildings.

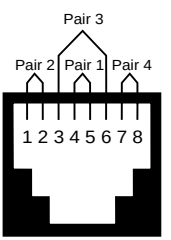
With the advent of 100Mb/s networking products, it is best to use higher quality CAT 5 cables like Belden or Helix as well as CAT 5-compliant patch panels, patch cables, and connectors while following the EIA/TIA wiring standards. 100 Ω UTP CAT 5 type cables use 4-pair UTP wiring.

Refer to the illustrations below for 4-pair wiring using either T568A (Fig. B-1) or T568B (Fig. B-2) wiring standards. Both T568A and T568B wiring is compatible with 10BASE-T and 100BASE-TX and require no special configurations, but for premise wiring, stick to one wiring standard. Mixing T568A and T568B wiring schemes may cause or lead to potential problems.



T568A

Fig. B-1 4-Pair T568A Wiring



T568B

Fig. B-2 4-Pair T568B Wiring

T568A	Pairs	Strand	Solid
Pin 1	Pair 3	Blue	White/Green
Pin 2	Pair 3	Orange	Green/White
Pin 3	Pair 2	Black	White/Orange
Pin 4	Pair 1	Red	Blue/White
Pin 5	Pair 1	Green	White/Blue
Pin 6	Pair 2	Yellow	Orange/White
Pin 7	Pair 4	Brown	White/Brown
Pin 8	Pair 4	White	Brown/White

Table. B-4 4-Pair T568A Wiring

T568B	Pairs	Strand	Solid
Pin 1	Pair 2	Black	White/Orange
Pin 2	Pair 2	Yellow	Orange/White
Pin 3	Pair 3	Blue	White/Green
Pin 4	Pair 1	Red	Blue/White
Pin 5	Pair 1	Green	White/Blue
Pin 6	Pair 3	Orange	Green/White
Pin 7	Pair 4	Brown	White/Brown
Pin 8	Pair 4	White	Brown/White

Table B-5 4-Pair T568B Wiring

UTP Cable Rating Codes

UTP cables meet different UL-NEC requirements based mostly on cable-jacket quality. Below is an explanation of the rating codes for each cable type.

UL – The National Electrical Code (NEC), published by the National Fire Protection Association (NFPA), details advisory safety considerations for electrical wiring. NEC Article 800 Communications Cables are manufactured to meet these different cable types.

1. **CMP** – Cables meeting type CMP requirements are suitable for installation in ducts and plenums without the use of conduit. These cables are designed for fire resistance and low-smoke and toxin producing characteristics.
2. **CMR** – Riser type cables are engineered to prevent the spread of fire from floor to floor and are suitable for vertical shaft applications.
3. **CM** – Cables for general building wiring. CM cables are used in areas other than plenums and risers. These cables are resistant to the spread of fire and pass the UL 1581Vertical Tray Flame Test.
4. **MP, MPR** & **MPP** – Within Article 800, the Multi-purpose Cables Category, allows conditional substitutions between different cable types & are restricted by number, AWG size and stranding of the cable conductors.

Terms You Should Be Familiar With

1. **BACKBONE WIRING** – The physical/electrical interconnections between telecommunications wiring closets and equipment rooms.
2. **COMPLIANCE** – A datacomm or wiring device that meets all characteristics of a standard is said to be in compliance with that standard.
3. **PREMISE WIRING** – The entire wiring system on the premises, especially the supporting wiring that connects the communications outlets to the network interface jack.
4. **NEAR-END CROSSTALK (NEXT) –** In wires packed together within a cable, the signals generated at one end of the link can flush out the weaker signals coming back from the recipient.

Appendix C Specifications

Fast EtheRx Model KNS500/WG	
Compliance:	IEEE 802.3u 100BASE-TX Standard IEEE802.3i 10BASE-T Standard IEEE802.3 CSMA/CD Ethernet Standard
Media Interface:	Five (5) auto-negotiating 10/100 Mbps UTP ports
Uplink Port:	UTP port 5
10BASE-T /100BASE-TX:	Auto-Negotiation
Half / Full-duplex mode:	Auto-Negotiation
Diagnostic LEDs:	1 LED for Power Indicator (steady green) 5 100BASE-TX speed detection LEDs(steady green) 5 Link LEDs (steady green) /Activity (flashing green) 5 LEDs for Full-Duplex (steady green) /Collision (flashing amber)
Switching Approach:	Store-and-Forward
Flow Control: Half Duplex: Full Duplex:	 Collision-based Backpressure IEEE 802.3x
MAC Address Support:	Up to 1K MAC addresses
Filtering/Forwarding Rate (min. packet size 64 bytes):	148,800 packets/second @ 100Mbps 14,880 packets/second @ 10Mbps
Latency (min. packet size 64 bytes)	100Mbps to 100Mbps ≤ 9.1µs 10Mbps to 10Mbps ≤ 64.6µs
Max Segment Length:	100 meters (328 feet)
Connector Type:	RJ-45, Female
Cable Type:	UTP 26 to 22 AWG
Cable Grade: 100BASE-TX: 10BASE-T:	 Category 5 or better Category 3, 4, 5 or better
Environmental:	
Operating Temp.	0°C to 45°C (32°F to 113°F)
Storage Temp.	-20°C to 60°C (-4°F to 140°F)
Relative Humidity	10% to 90% non-condensing
Electrical:	
Input Voltage:	120VAC/60Hz or 240VAC/50Hz, ext. power adapter
Output Voltage:	12VDC/1.2A
Power Consumption:	8.0 Watts maximum
Physical:	
Dimension (HxWxD):	1.1” x 6.5” x 6.1” (28mm x 165mm x 155mm)
Weight:	2 lbs. (0.9 kg)
Certification	
EMI Standards:	FCC Class A, CE CISPR A, C-Tick
EMC Standards:	EN55022, IEC801-2, IEC801-3, IEC801-4
Low Voltage Directive:	EN60950

Fast EtheRx Model KNS800/WG	
Compliance:	IEEE 802.3u 100BASE-TX Standard IEEE802.3i 10BASE-T Standard IEEE802.3 CSMA/CD Ethernet Standard
Media Interface:	Eight (8) auto-negotiating 10/100 Mbps UTP ports
Uplink Port:	UTP port 8
10BASE-T /100BASE-TX:	Auto-Negotiation
Half / Full-duplex mode:	Auto-Negotiation
Diagnostic LEDs:	1 LED for Power Indicator (steady green) 8 100BASE-TX speed detection LEDs(steady green) 8 Link LEDs (steady green) /Activity (flashing green) 8 LEDs for Full-Duplex (steady green) /Collision (flashing amber)
Switching Approach:	Store-and-Forward
Flow Control: Half Duplex: Full Duplex:	 Collision-based Backpressure IEEE 802.3x
MAC Address Support:	Up to 1K MAC addresses
Filtering/Forwarding Rate (min. packet size 64 byte):	148,800 packets/second @ 100Mbps 14,880 packets/second @ 10Mbps
Latency (min. packet size 64 byte)	100Mbps to 100Mbps ≤ 8.8µs 10Mbps to 10Mbps ≤ 64.4µs
Max Segment Length:	100 meters (328 feet)
Connector Type:	RJ-45, Female
Cable Type:	UTP 26 to 22 AWG
Cable Grade: 100BASE-TX: 10BASE-T:	 Category 5 or better Category 3, 4, 5 or better
Environmental:	
Operating Temp.	0°C to 45°C (32°F to 113°F)
Storage Temp.	-20°C to 60°C (-4°F to 140°F)
Relative Humidity	10% to 90% non-condensing
Electrical:	
Input Voltage:	100VAC – 240VAC, 50/60Hz, external auto-sensing power supply
Output Voltage:	5VDC/3A
Power Consumption:	9.8 Watts maximum
Physical:	
Dimension (HxWxD):	1.1” x 6.5” x 6.1” (28mm x 165mm x 155mm)
Weight:	2 lbs. (0.9 kg)
Certification	
EMI Standards:	FCC Class A, CE CISPR A, C-Tick
EMC Standards:	EN55022, IEC801-2, IEC801-3, IEC801-4
Low Voltage Directive:	EN60950

Appendix D Frequently Asked Questions

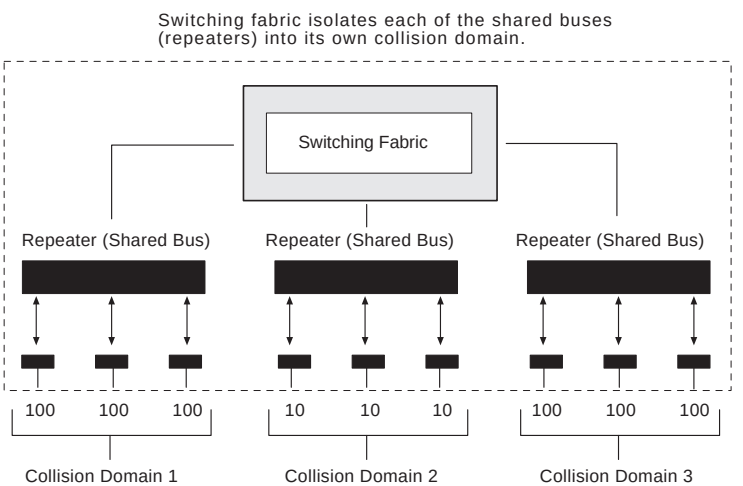
What is a switch and what does it do?

Switching hubs are low-latency devices that allow you to maximize the bandwidth of a network using concurrent access within the unit. Switches allow you to segment LANs, connect LANs of different speeds, or extend the collision domain of an existing LAN.

What's the difference between a repeater and a switch?

A repeater is a device that extends the diameter of a network by regenerating and forwarding received Ethernet packets. It repeats incoming signals to all other ports on the device.

Like a repeater, a switch can also extend the diameter of a network. However, a switch can also extend the collision domain of a network, like bridging a 10Mbps Ethernet LAN with a 100Mbps Fast Ethernet LAN. See the illustration below. A switch can also be configured to operate in half-duplex or full-duplex mode, whereas a repeater can only operate in half-duplex mode.



Category 5 Compliance vs. Category 5 Performance?

Using CAT 5 cabling in your network installation does not necessarily achieve full Category 5 performance. To achieve any category-rated performance, make sure all cabling components, including modular plugs, trunk cables, and patch panels, are at least of the minimum category required.

To achieve full CAT 5 performance, all components must be CAT 5 compliant and terminated properly according to EIA/TIA-568 TSB-36 and TSB-40 guidelines.

What are the Guidelines for Proper Termination?

It is important to maintain the twists of the cable as close to the termination on the outlet as possible, to avoid NEXT (Near End Cross Talk) and to maintain the transmission characteristics of the Category. Category specifications require that pair twisting, at the point of termination, not exceed the following maximums:

- **Category 3 maximum allowed untwisting:** 3 inches
- **Category 4 maximum allowed untwisting:** 1 inch
- **Category 5 maximum allowed untwisting:** 1/2 inch

Can I mix CAT 3 and CAT 5 cabling in the same building?

Yes, but keep in mind, you will not have CAT 5 performance. It is a good idea to keep the lines separated, physically and by color, when installing any new lines, use CAT 5 UTP cabling only.

Can a Four-Pair CAT 5 cable support two 100BASE-TX devices?

Although only two pairs are used in the standard four-pair CAT 5 UTP cable, it is not recommended because it exceeds the specifications outlined by IEEE 802.3u.

Appendix E Warranties and Notices

Limited Warranty Statement

KINGSTON TECHNOLOGY COMPANY ("Kingston") warrants that this product is free from defects in material and workmanship. Subject to the conditions and limitations set forth below, Kingston will, at its option, either repair or replace any part of this product which proves defective by reason of improper workmanship or materials. Repair parts or replacement products will be provided by Kingston on an exchange basis, and will either be new or refurbished to be functionally equivalent to new.

This warranty does not cover any damage to this product that results from accident, abuse, misuse, natural or personal disaster, or any unauthorized disassembly, repair or modification.

Duration of Warranty

***Lifetime Warranty*:** The following Kingston products are covered by this warranty for life: memory modules and expansion boards, networking adapters, networking hubs without cooling fans (excluding the power supply), and microprocessor upgrade products.

***Seven Year Warranty*:** The following Kingston products are covered by this warranty for a period of seven years from the date of original retail purchase: all core storage enclosures (including the power supply), cables, terminators, and related accessories. Under certain agreements where core products are slightly modified (e.g. paint, handle, etc.) by Kingston at the customer's request, the product will be covered for a period of seven years for repair only. Storage products that are custom designed and /or incorporate component-level modification by Kingston in order to meet specific customer requests, will be negotiated with the applicable customer on a per case basis.

Five Year Warranty: The following Kingston products are covered by this warranty for a period of five years from the date of original retail purchase: the power supply in networking hubs without cooling fans; Flash memory cards (e.g. CompactFlash, ATA Flash, and Linear Flash); solid state PC Card (PCMCIA) adapters, PC Card Readers and all other Kingston products (other than those products covered by a three-year, two-year, or one-year warranty, as provided below).

Three Year Warranty: The following Kingston products are covered by this warranty for a period of three years from the date of original retail purchase: networking hubs with cooling fans (including the power supply).

Two Year Warranty: The following Kingston products are covered by this warranty for a period of two years from the date of original retail purchase: Solid State Floppy Disk Cards (SSFDC), and Winchester hard disk drives in a 2.5 inch, 3.5 inch or 5.25 inch form factor.

***One Year Warranty*:** The following Kingston products are covered by this warranty for a period of one year from the date of original retail purchase: Winchester hard disk drives in a 1.8 inch form factor, optical storage products, and magnetic tape storage products.

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Warranty Claim Requirements

To obtain warranty service, return the defective product, freight prepaid and insured, to your local authorized Kingston dealer or distributor, or to the Kingston factory service center located at 17600 Newhope Street, Fountain Valley, California 92708, U.S.A. You must include the product serial number (if applicable) and a detailed description of the problem you are experiencing. You must also include proof of the date of original retail purchase as evidence that the product is within the applicable warranty period. If you return the product directly to the Kingston factory, you must first obtain a Return Material Authorization ("RMA") number by calling Kingston Customer Service at (714) 438-1810, and include the RMA number prominently displayed on the outside of your package. Products must be properly packaged to prevent damage in transit.

Free Technical Support

Kingston provides free technical support. If you experience any difficulty during the installation or subsequent use of a Kingston product, please contact Kingston's Technical Support department prior to servicing your system.

Kingston Technical Support can be reached in the U.S. at (714) 435-2639 or toll-free at (800) 435-0640 (U.S. and Canada only). Kingston European Technical Support can be reached from within the U.K. at 01932 738858. Kingston provides other service numbers when calling from Germany 0130 115 639 or fax 0130 860 599, from Austria 0660 5569 or fax 06 607 434, from Switzerland 0800 557 748 or fax 0800 552 182, from France 0800 905 701 or fax 0800 900 910, or from Belgium (in English) 0800 72763.

This warranty covers only repair or replacement of defective Kingston products, as provided above. Kingston is not liable for, and does not cover under warranty, any costs associated with servicing and/or the installation of Kingston products.

Disclaimers

The foregoing is the complete warranty for Kingston products and supersedes all other warranties and representations, whether oral or written. Except as expressly set forth above, no other warranties are made with respect to Kingston products and Kingston expressly disclaims all warranties not stated herein, including, to the extent permitted by applicable law, any implied warranty of merchantability or fitness for a particular purpose. In no event will Kingston be liable to the purchaser, or to any user of the Kingston product, for any damages, expenses, lost revenues, lost savings, lost profits, or any other incidental or consequential damages arising from the purchase, use or inability to use the Kingston product, even if Kingston has been advised of the possibility of such damages.

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F.C.C. Certification

This device has been tested and found to comply with limits for Class A digital device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received; including interference that may cause undesired operation.

CE Notice

The official CE symbol indicates compliance of this Kingston Technology product to the EMC directive of the European Community. The CE symbol indicates that this Kingston product meets or exceeds the following standards:

- **EN50081-1** "Electromagnetic Compatibility-generic emissions standard"
  EN55022: "Limits and methods of measurement of radio interference characteristics."
- **EN50082-1** "Electromagnetic Compatibility-generic immunity standard"
  IEC 801-2: "Electrostatic discharge requirements"
  IEC 801-3: "Radiated immunity requirements"
  IEC 801-4: "Electrical fast transient requirements"
- **EN60950** "Low Voltage Directive (LVD)"
- **Declaration of CE Conformity** in accordance with the above standards has been made and is on file at Kingston Technology.

CE

C-Tick Certification

- **AS/NZS 3548** "Information Technology Equipment"
- **Declaration of C-Tick Conformity** in accordance with the above standards has been made and is on file at Kingston Technology.

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